

Amendments to the Claims

- 1-74. (Previously Cancelled)
75. (Previously Presented) An apparatus for down-converting an electromagnetic signal, comprising:
- a capacitor having a first and second port;
 - a switching device having a first, second, and third port; and
 - a resonant structure having a first and second port,
- wherein the first port of the capacitor is electrically coupled to the second port of the switching device, and the first port of the resonant structure is electrically coupled to the first port of the switching device, and
- wherein a control signal is electrically coupled to the third port of the switching device, and an RF source signal is electrically coupled to the first port of the resonant structure.
76. (Previously Presented) The apparatus of claim 75, wherein a value of capacitance for the capacitor is selected so that the capacitor discharges stored energy to a load when the switching device is open.
77. (Previously Presented) The apparatus of claim 75, wherein a value of capacitance (C_s) for the capacitor is selected based on a frequency ($freqLO$) of energy transfer pulses, a duration ($Aperture_Width$) of an aperture of the switching device, and a resistance (R) such that

$$C_s(R) = \left(\frac{\frac{1}{freqLO} - Aperture_Width}{-\ln(0.841) \cdot R} \right).$$

78. (Currently Amended) The apparatus of claim 75, wherein a duration of an aperture of pulses of the control signal ~~the switching device~~ is nominally equal to one-half of a period of the electromagnetic signal.
79. (Previously Presented) The apparatus of claim 75, wherein the first port of the capacitor is electrically coupled to an impedance matching network.
80. (Previously Presented) The apparatus of claim 75, wherein the first port of the capacitor is electrically coupled to an amplifier.
81. (Previously Presented) The apparatus of claim 75, wherein the first port of the resonant structure is electrically coupled to an impedance matching network.
82. (Previously Presented) The apparatus of claim 75, wherein the switching device is a transistor.
83. (Previously Presented) The apparatus of claim 75, wherein the switching device is a FET.
84. (Previously Presented) The apparatus of claim 75, wherein the switching device is a JFET.
85. (Previously Presented) The apparatus of claim 75, wherein the switching device is a MOSFET.
86. (Previously Presented) An apparatus for down-converting an electromagnetic signal, comprising:

a first and second capacitor each having a first and second port;

a switching device having a first, second, and third port; and

a resonant structure having a first and second port,

wherein the first port of the first capacitor is electrically coupled to the second port of the switching device, the first port of the second capacitor is electrically coupled to the first port of the switching device, the second port of the second capacitor is electrically coupled to the second port of the switching device, and the first port of the resonant structure is electrically coupled to the first port of the switching device, and

wherein a control signal is electrically coupled to the third port of the switching device, and an RF source signal is electrically coupled to the first port of the resonant structure.

87. (Previously Presented) The apparatus of claim 86, wherein a value of capacitance for the first capacitor is selected so that the capacitor discharges stored energy to a load when the switching device is open.
88. (Previously Presented) The apparatus of claim 86, wherein a value of capacitance (C_s) for the first capacitor is selected based on a frequency ($freqLO$) of energy transfer pulses, a duration ($Aperture_Width$) of an aperture of the switching device, and a resistance (R) such that

$$C_s(R) = \left(\frac{\frac{1}{freqLO} - Aperture_Width}{-\ln(0.841) \cdot R} \right)$$

89. (Currently Amended) The apparatus of claim 86, wherein a duration of an aperture of pulses of the control signal ~~the switching device~~ is nominally equal to one-half of a period of the electromagnetic signal.

90. (Previously Presented) The apparatus of claim 86, wherein the first port of the first capacitor is electrically coupled to an impedance matching network.
91. (Previously Presented) The apparatus of claim 86, wherein the first port of the first capacitor is electrically coupled to an amplifier.
92. (Previously Presented) The apparatus of claim 86, wherein the first port of the resonant structure is electrically coupled to an impedance matching network.
93. (Previously Presented) The apparatus of claim 86, wherein the switching device is a transistor.
94. (Previously Presented) The apparatus of claim 86, wherein the switching device is a FET.
95. (Previously Presented) The apparatus of claim 86, wherein the switching device is a JFET.
96. (Previously Presented) The apparatus of claim 86, wherein the switching device is a MOSFET.
97. (Previously Presented) An apparatus for down-converting an electromagnetic signal, comprising:

a capacitor having a first and second port; and

a first and second switching device each having a first, second, and third port,

wherein the first port of the capacitor is electrically coupled to the second port of the first switching device and the second port of the capacitor is electrically coupled to the second port of the second switching device, and the third port of the

first switching device is electrically coupled to the third port of the second switching device, and

wherein a control signal is electrically coupled to the third port of the first switching device and the third port of the second switching device, and an RF source signal is electrically coupled to the first port of the first switching device and the first port of the second switching device.

98. (Previously Presented) The apparatus of claim 97, further comprising:

a resonant structure having a first and second port,

wherein the first port of the resonant structure is electrically coupled to the first port of the first switching device, and the second port of the resonant structure is coupled to the first port of the second switching device.

99. (Currently Amended) The apparatus of claim 98 97, further comprising:

a first and second impedance each having a first and second port,

wherein the first port of the first impedance is electrically coupled to the first port of the resonant structure and the first port of the second impedance is electrically coupled to the second port of the resonant structure, and

wherein the an RF source signal is electrically coupled to the second port of the first impedance and the second port of the second impedance.

100. (Previously Presented) The apparatus of claim 97, wherein a value of capacitance for the capacitor is selected so that the capacitor discharges stored energy to a load when the switching device is open.

101. (Previously Presented) The apparatus of claim 97, wherein a value of capacitance (C_s) for the capacitor is selected based on a frequency (*freqLO*) of energy transfer pulses, a

duration (*Aperture_Width*) of an aperture of the switching device, and a resistance (*R*) such that

$$C_s(R) = \left(\frac{\frac{1}{freqLO} - Aperture_Width}{-\ln(0.841) \cdot R} \right).$$

102. (Currently Amended) The apparatus of claim 97, wherein a duration of an aperture of pulses of the control signal ~~the first and second switching devices~~ is nominally equal to one-half of a period of the electromagnetic signal.
103. (Previously Presented) The apparatus of claim 97, wherein the first port of the capacitor is electrically coupled to an amplifier.
104. (Previously Presented) The apparatus of claim 97, wherein the first and second ports of the capacitor are electrically coupled to first and second ports of a differential amplifier.
105. (Previously Presented) The apparatus of claim 97, wherein the first and second switching devices are transistors.
106. (Previously Presented) The apparatus of claim 97, wherein the first and second switching devices are FETs.
107. (Previously Presented) The apparatus of claim 97, wherein the first and second switching devices are JFETs.
108. (Previously Presented) The apparatus of claim 97, wherein the first and second switching devices are MOSFETs.

109. (Currently Amended) An apparatus for down-converting an electromagnetic signal, comprising:


a first and second capacitor each having a first and second port;
a switching device having a first, second, and third port; and
a load,

wherein the first port of the first capacitor is electrically coupled to the second port of the switching device, the first port of the second capacitor is electrically coupled to the first port of the switching device, the load is electrically coupled to the second port of the switching device and the second port of the second capacitor is electrically coupled to the second port of the switching device, and

wherein a control signal is electrically coupled to the third port of the switching device, and an RF source signal is electrically coupled to the first port of the switching device.

110. (Previously Presented) The apparatus of claim 109, wherein a value of capacitance for the first capacitor is selected so that the capacitor discharges stored energy to a load when the switching device is open.
111. (Previously Presented) The apparatus of claim 109, wherein a value of capacitance (C_s) for the first capacitor is selected based on a frequency ($freqLO$) of energy transfer pulses, a duration ($Aperture_Width$) of an aperture of the switching device, and a resistance (R) such that

$$C_s(R) = \left(\frac{\frac{1}{freqLO} - Aperture_Width}{-\ln(0.841) \cdot R} \right).$$

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112. (Previously Presented) The apparatus of claim 109, wherein a duration of an aperture of the switching device is nominally equal to one-half of a period of the electromagnetic signal.
113. (Previously Presented) The apparatus of claim 109, wherein the first port of the first capacitor is electrically coupled to an impedance matching network.
114. (Previously Presented) The apparatus of claim 109, wherein the first port of the first capacitor is electrically coupled to an amplifier.
115. (Currently Amended) The apparatus of claim 109, wherein the first port of the ~~resonant structure~~ second capacitor is electrically coupled to an impedance matching network.
116. (Previously Presented) The apparatus of claim 109, wherein the switching device is a transistor.
117. (Previously Presented) The apparatus of claim 109, wherein the switching device is a FET.
118. (Previously Presented) The apparatus of claim 109, wherein the switching device is a JFET.
119. (Previously Presented) The apparatus of claim 109, wherein the switching device is a MOSFET.
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